National Institute of Environmental Health Sciences

Interactions between rainfall, deforestation and fires during recent years in the Brazilian Amazonia

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Abstract:

Understanding the interplay between climate and land-use dynamics is a fundamental concern for assessing the vulnerability of Amazonia to climate change. In this study, we analyse satellite-derived monthly and annual time series of rainfall, fires and deforestation to explicitly quantify the seasonal patterns and relationships between these three variables, with a particular focus on the Amazonian drought of 2005. Our results demonstrate a marked seasonality with one peak per year for all variables analysed, except deforestation. For the annual cycle, we found correlations above 90% with a time lag between variables. Deforestation and fires reach the highest values three and six months, respectively, after the peak of the rainy season. The cumulative number of hot pixels was linearly related to the size of the area deforested annually from 1998 to 2004 (r2Euro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin)0.84, pEuro Surveillance (Bulletin Europeen Sur Les Maladies Transmissibles; European Communicable Disease Bulletin)0.004). During the 2005 drought, the number of hot pixels increased 43% in relation to the expected value for a similar deforested area (approx. 19 000 km2). We demonstrated that anthropogenic forcing, such as land-use change, is decisive in determining the seasonality and annual patterns of fire occurrence. Moreover, droughts can significantly increase the number of fires in the region even with decreased deforestation rates. We may expect that the ongoing deforestation, currently based on slash and burn procedures, and the use of fires for land management in Amazonia will intensify the impact of droughts associated with natural climate variability or human-induced climate change and, therefore, a large area of forest edge will be under increased risk of fires.

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Resource Description

Communication: ☑

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: ☑

audience to whom the resource is directed

Researcher

Exposure : ☑

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Extreme Weather Event, Precipitation

Extreme Weather Event: Wildfires

Geographic Feature: ☑

resource focuses on specific type of geography

Tropical

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Central/South America

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content